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10/781,353

02/17/2004

Jennifer Wang

P1571

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7590

07/24/2006

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EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.



**Office Action Summary**

Application No.

10/781,353

Applicant(s)

WANG ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21 and 22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |



## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 12, 2006 has been entered.

### ***Status of the Claims***

2. Amendment filed May 12, 2006 has been entered. Claims 21 and 22 have been amended. Claims 1-22 are pending. Non-elected invention, claims 1-20 have been withdrawn.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 21 and 22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.



There does not appear to be a written description of the claim limitation “the via hole comprises an aspect ratio which is greater than 1, and is of substantially the same diameter throughout the depth of the via hole” (amended claims 21 and 22) in the application as filed.

The description of the via hole 26, as shown in Fig. 3, page 7, [0029], includes: the opening width 50 is 1.66 microns and the bottom width 48 is 1.32 microns. The specification, page 8, [0032], further adds: in contrast, prior wet etching process did not produce *the tapered via hole of the present invention*.

Clearly, the via hole is tapered.

Applicant must cancel the new matter in response to the Office Action.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22, line 16-18 recites: creating at least one tapered sidewall within a via hole, whereby the via hole comprises an aspect ratio which is greater than 1, and is of substantially the same diameter throughout the depth of the via hole.

The two terms of the via hole: tapered sidewall and substantially the same diameter through out the depth are contradicting each other.

If the via is tapered then the diameter of the via is varied along the depth and if the diameter is the same throughout the depth then the sidewall can not be tapered.



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Therefore, claim 22 is indefinite.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yu et al. (U.S. Patent No. 6,004,883) of record in view of Lin (U.S. Pub. No. 2002/0068441).

With respect to claim 21, insofar as the device is concerned and as best understood by the examiner, Yu teaches a device including a via substantially as claimed including:

a hard mask (18) on a polymer layer (16);

a photoresist mask (20) on the hard mask (18)

at least one via hole (25) with vertical sidewall, defined in the polymer layer (16), and is of substantially the same diameter throughout the depth of the via hole (25). (See Figs. 2-3).

Thus, Yu is shown to teach all the features of the claim with the exception of explicitly disclosing the aspect ratio of the via.

However, Lin teaches via (7) defined in a polymer layer (5) having an aspect ratio of greater than 1 are routinely used to for the contact in ULSI, and is of substantially the same diameter throughout the depth of the via hole.



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Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to define the via of Yu having an aspect ratio of greater than 1 in the polymer layer as taught by Lin to form contacts to a lower layer.

Furthermore, it would have been an obvious matter of design choice to define a via having aspect ratio greater than 1, since such a modification would have involve a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955).

Product by process limitation:

The expression “a via produced by the process comprising the steps of” and “*placing*” and “*releasing a first fluoride gas into a chamber to etch a hard-mask opening for defining said via hole; and releasing a second fluoride gas into said chamber to etch an exposed portion of said polymer layer defining said via hole with vertical sidewalls*” is/are taken to be a product by process limitation and *are given no patentable weight*. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old



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and obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not.

**Note that Applicant has burden of proof in such cases** as the above case law makes clear.

6. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schuck, III et al. (U.S. Patent No. 5,868,951) of record in view of Lin (U.S. Pub. No. 2002/0068441).

With respect to claim 22, insofar as the device as concerned, and as best understood by the examiner, Schuck teaches a device having a via substantially as claimed including:

a polymer layer having sub-micron wide tapered sidewalls via-opening formed on a semiconductor substrate; and

a hard-mask for defining the sub-micron wide via-opening formed on the polymer layer. (See Fig. 4A).

Thus, Schuck is shown to teach all the features of the claim with the exception of explicitly disclosing the size of the via.

However, Lin teaches via (70) with tapered sidewall is defined in a polymer layer (64) having an aspect ratio of greater than 1 are routinely used to for the contact in ULSI and the via hole (70) is of substantially the same diameter throughout the depth of the via hole.



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Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to define the tapered sidewall via of Schuck having an aspect ratio of greater than 1 in the polymer layer as taught by Lin to form contacts to a lower layer.

Furthermore, it would have been an obvious matter of design choice to define a via having aspect ratio greater than 1, since such a modification would have involve a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955).

Product by process limitation:

The expression “a via produced by the process comprising the steps of” and “placing in a chamber”; “defining”; “deposited” “releasing a third fluoride gas into said chamber; applying bias power within the range of approximately 105 Watts to approximately 120 Watts; applying pulse-modulated power within the range of approximately 725 Watts to approximately 755 Watts; pressurizing said third fluoride gas within a range of approximately 5 milli-Torr to approximately 20 milli-Torr; and continuing the above steps until etching said hard-mark and an exposed portion of said polymer layer proximal to said sub-micron wide via-opening creating tapered sidewalls” is/are taken to be a product by process limitation and is given no patentable weight. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir.



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1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not.

**Note that Applicant has burden of proof in such cases** as the above case law makes clear.

### ***Response to Arguments***

7. Applicant's arguments filed May 12, 2006 have been fully considered but they are not persuasive.

Applicant appears to argue about the method, while the claim is a device.

As clearly discussed in the rejection, the product-by-process limitation is given no patentable weight and the cited case law are very clear on that.

Further, the via hole 25 of Yu is clearly of substantially the same diameter throughout its depth. Note that, via hole 25 is the portion formed in the polymer layer 16.

### ***Conclusion***

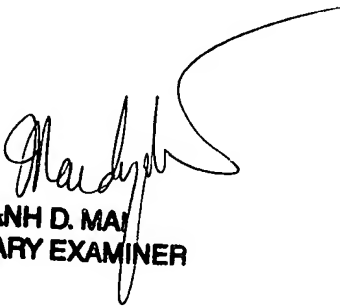
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**ANH D. MAI**  
**PRIMARY EXAMINER**